

LAKE CLASSIFICATION SHORT REPORT ON WOLF LAKE, ADAMS COUNTY, WI



**Presented by Reesa Evans, CLM, Lake Specialist
Adams County Land & Water Conservation Department
P.O. Box 287, Friendship, WI 59334**

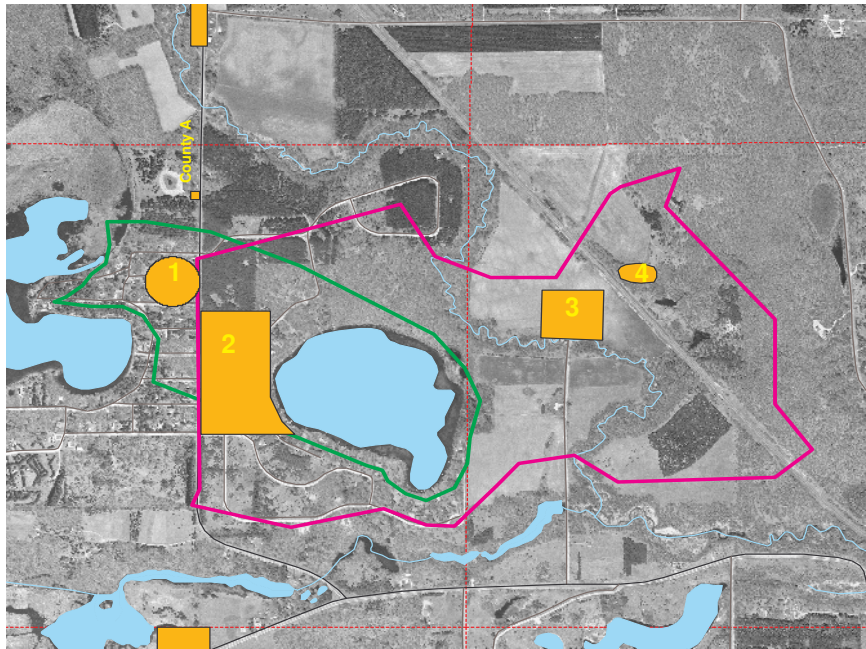
JULY 2007

Introduction

Information about Wolf Lake: Wolf Lake is located in the Town of Jackson, Adams County, WI (T15N, R7E, S11), in the south central part of Wisconsin. It is accessed off of County A as it turns south. Wolf Lake has 49 surface acres and a maximum depth of 58 feet. Wolf Lake is a “seepage” lake, a natural lake fed by precipitation, surface runoff, and groundwater. With no stream outlet, water leaves the lake through groundwater seepage or by evaporation from the lake’s surface. The water table in most areas around the lake is less than 20’ below the surface.



Archeological Sites



1 inch = 2400 feet
RF-4/05, revised 7/06

*information from Wisconsin
Historical Society



Conical mound

There are many Native American archeological sites in Adams County, with four being located right around Wolf Lake. Three of the sites are burial mound groups—shaped in conical, linear or effigy (animal) forms. To preserve Native American Heritage, the federal act on Native American burials and the corresponding Wisconsin law prohibits disturbance of these sites without permission of the federal government and input from the local tribes.

Land Use

Both the surface and ground watersheds of Wolf Lake are fairly small. Studies have shown lakes are products of their watersheds, and that land use has great impacts on the lake water quality, especially in the amount and content of stormwater runoff from the impervious surfaces. Natural undisturbed landscapes tend to have low stormwater runoff levels.

Land use categories in acreage and percent of total area are:

	Surface		Ground		Total	
Wolf Lake	Acres	% Total	Acres	% Total	Acres	% Total
Agriculture--Non Irrigated	116.23	17.28%	0		116.23	14.45%
Residential	209.85	31.19%	99.01	75.24%	308.86	38.40%
Water	51.72	7.69%	0		51.72	6.43%
Woodland	294.98	43.84%	32.59	24.76%	327.57	40.72%
total	672.78	100.00%	131.6	100.00%	804.38	100.00%

Forested land is the largest land use category in both Wolf Lake watersheds. Since forest floors are often full of leaves, needles and other duff, runoff from forested lands is may be more filtered than that from agricultural or residential lands.

Residential land use is the next most common land use category in Wolf Lake watersheds, especially around the lake itself, where residential land use is most concentrated. This land use category may also contribute a significant amount of nutrients to the water from stormwater runoff, mowed lawns, and impervious surfaces. It is important to reduce nutrients from these sources.

Slightly over 20% of the surface watershed for Wolf Lake is non-irrigated agriculture. Agriculture may also contribute significant amounts of nutrients in water. It is important to reduce nutrients from this source.

The remaining land use category in Wolf Lake watersheds is wetland. Wetlands play an important role in water quality by trapping many pollutants in runoff waters and by serving as buffers to catch and control what would otherwise be uncontrolled water and pollutants. Wetlands also play an essential role in the aquatic food chain, thus affecting fishery, and also serve as spaces for wildlife habitat, wildlife reproduction & nesting, and wildlife food.

The photo below shows one of the wetlands along Wolf Lake's shore. There are several wetlands at or near Wolf Lake's shore (shown on land use maps following). It is essential to preserve these wetlands for the continued health of Wolf Lake waters.



**One of Wolf
Lake's shore
wetland areas**

Like many lakes in Wisconsin, Wolf Lake is a phosphorus-limited lake. This means that of the pollutants deposited in the lake, the one that is in the shortest supply and most affects the lake water quality is phosphorus. Land use types play a major role in determining the amount of phosphorus being loaded into the lake. Recent statistics and computer modeling suggest that currently both residential and non-irrigated agriculture are the greatest contributors of phosphorus to Wolf Lake.

PHOSPHORUS LOADING	Loading	% of total
Land Use Type	lb/yr	P loading
Non-Point Sources		
Non-Irrigated Agriculture	41.80	32.7%
Residential	44.00	35.6%
Forest	13.20	10.4%
Groundwatershed	6.60	4.6%
Lake Surface	6.60	5.2%
septics	14.52	11.50%
total in pounds/year	126.72	100.0%

Some aspects of phosphorus loading can't be modified by human behavior—they are simply part of the natural landscape. However, phosphorus loading from agriculture, residential and septic use of the land can be decreased or increased, often with significant results in phosphorus loading amounts. The figures below may not seem like much---until you calculate that one pound of phosphorus can result in up to 500 pounds of algae. A 10% reduction in these three areas could result in 5345 pounds less of algae per year!

PHOSPHORUS LOADING	Loading			
Land Use Type	lb/yr			
Non-Point Sources		-10%	-25%	-50%
Non-Irrigated Agriculture	41.80	37.62	31.35	20.90
Residential	44.00	39.60	33.00	22.00
Forest	13.20	13.20	13.20	13.20
Groundwatershed	6.60	5.94	4.95	3.30
Lake Surface	6.60	6.60	6.60	6.60
septics	14.52	13.07	10.89	7.26
total in pounds/year	126.72	116.03	99.99	73.26

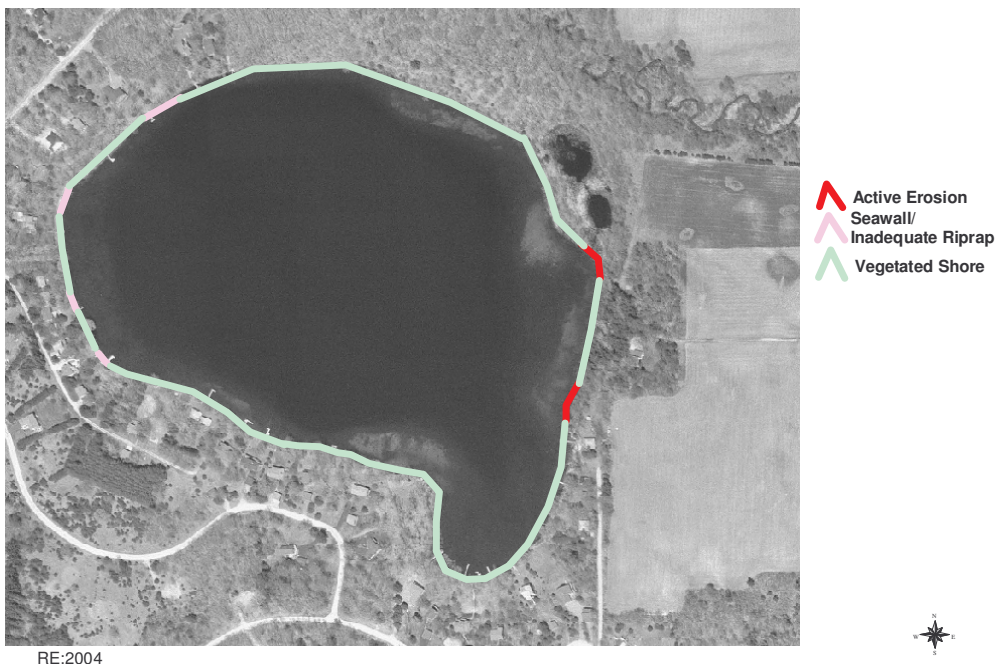
Shorelands

Wolf Lake has a total shoreline of 1.4 miles (7392 feet). About 1/3 of the northern shore is owned by the Wisconsin Department of Natural Resources and has been left unaltered. Included in that area are a bog and a sedge meadow.

The other 2/3 of the lakeshore is in residential use. Most of the areas near the shore are steeply sloped, except at the far northeast end, where the land is flatter. Buildings are generally located 70 or more feet back from the shore.

According to a 2005 field survey, 63% of Wolf Lake's shore is vegetated with native trees, shrubs and/or herbaceous vegetation.

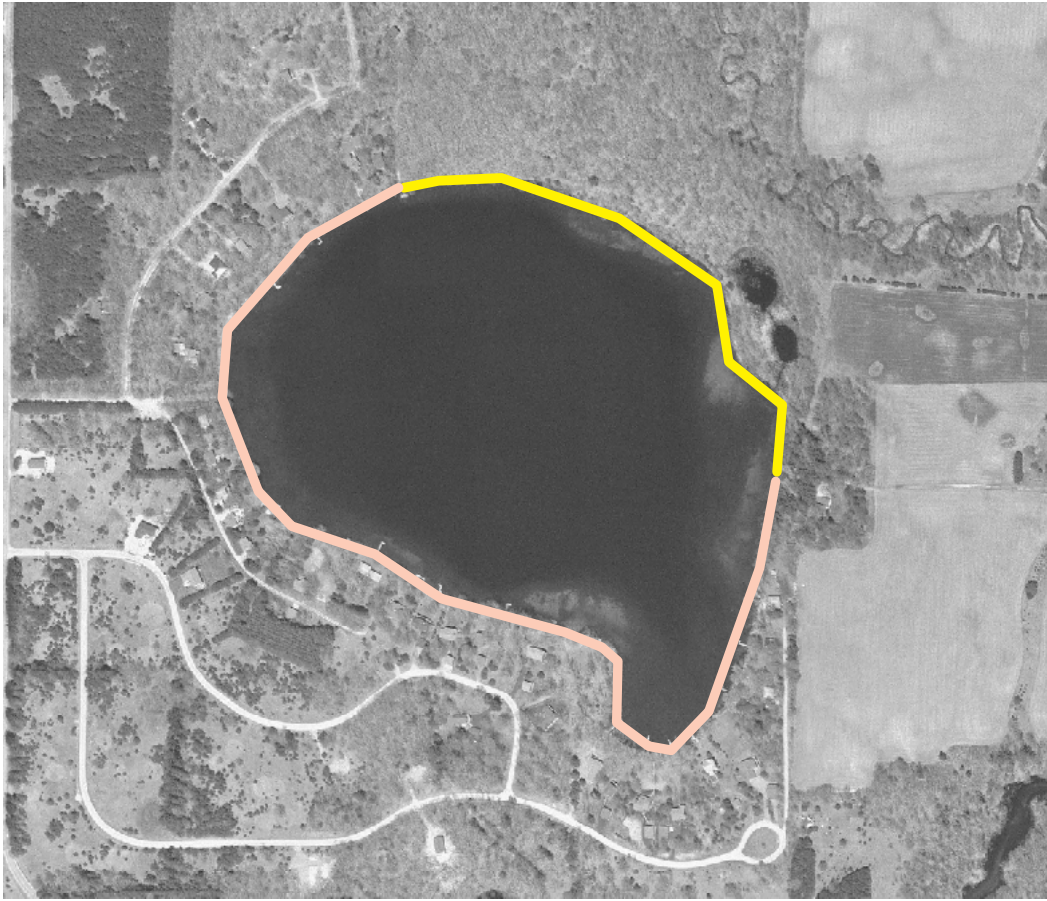
Wolf Lake Shoreline Map





Despite the high level of vegetated shore, a 2004 shore survey showed that only 32.6% of the shore had an “adequate buffer.” An “adequate buffer” is defined as a native vegetation strip at least 35 feet landward from the shore.

Most of the “inadequate” buffer areas were those with mowed lawns and/or insufficient native vegetation at the shoreline to cover 35 feet landward from the water line. Only 217 feet (2.9%) of the shoreline had active erosion.

Wolf Lake Buffer Map



 Adequate Buffer
 Inadequate Buffer



RE:2004

Shoreland buffers are an important part of lake protection and restoration. These buffers are simply a wide border of native plants, grasses, shrubs and trees that filter and trap soil & similar sediments, fertilizer, grass clippings, stormwater runoff and other potential pollutants, keeping them out of the lake. A 1990 study by the Wisconsin Department of Natural Resources of Wisconsin shorelines revealed that a buffer of native vegetation traps 5 to 18 times more volume of potential pollutants than does a developed, traditional lawn or hard-armored shore. The filtering process and bank stabilization that buffers provide help improve a lake's water quality, including water clarity.



Example of Adequate Buffer



Example of Inadequate Buffer

Vegetated shoreland buffers help stabilize shoreline banks, thus reducing bank erosion. The plant roots give structure to the bank and also increase water infiltration and decrease runoff. A vegetated shore is especially important when shores are steep and sandy, as are several of the Wolf Lake shores.

Water Quality Information

One of the measures Wisconsin uses to give a general estimate of a lake's water quality is the **trophic state index**. This index looks at a lake's water clarity, its amount of total phosphorus (the element most related to aquatic plant and algal growth), and its chlorophyll-a level (chlorophyll-a is a pigment used by algae for photosynthesis).

Depending on the trophic index score, lakes are then classified as **Oligotrophic** (good), **Mesotrophic** (fair), or **Eutrophic** (poor):

- **Good:** Oligotrophic lakes have clear, deep water with few algal blooms. Larger game fish are often found in such lakes.
- **Fair:** Mesotrophic lakes have more aquatic plant and algae production, with occasional algal blooms and a good fishery. The water is usually not as clear as that of oligotrophic lakes.
- **Poor:** Eutrophic lakes are very productive, with lots of aquatic plants and algae. Algal blooms are often frequent in these lakes. They may have a diverse fishery, but rough fish (such as carp) are also common. Water is often cloudy or murky. Small shallow lakes are more likely to be eutrophic.

Score	<u>TSI Level Description</u>
30-40	<u>Oligotrophic:</u> clear, deep water; possible oxygen depletion in lower depths; few aquatic plants or algal blooms; low in nutrients; large game fish usual fishery
40-50	<u>Mesotrophic:</u> moderately clear water; mixed fishery, esp. panfish; moderate aquatic plant growth and occasional algal blooms; may have low oxygen levels near bottom in summer
50-60	<u>Mildly Eutrophic:</u> decreased water clarity; anoxic near bottom; may have heavy algal bloom and plant growth; high in nutrients; shallow eutrophic lakes may have winterkill of fish; rough fish common
60-70	<u>Eutrophic:</u> dominated by blue-green algae; algae scums common; prolific aquatic plant growth; high nutrient levels; rough fish common; susceptible to oxygen depletion and winter fishkill
70-80	<u>Hypereutrophic:</u> heavy algal blooms through most of summer; dense aquatic plant growth; poor water clarity; high nutrient levels

Wolf Lake's overall TSI is 42



Water clarity readings are usually taken by using a Secchi disk (shown at right). Average summer Secchi disk clarity in Wolf Lake in 2004-2006 was 13.63 feet. The water clarity in Wolf Lake has consistently scored in the “very good” clarity category since 1990 records. Water clarity can be reduced by turbidity (suspended materials such as algae and silt) and dissolved organic chemicals that color or cloud the water.

Increased phosphorus levels in a lake will feed algal blooms and also may cause excess plant growth. The 2004-2006 summer average phosphorus concentration in Wolf Lake was 17.3 micrograms/liter. This is below the 25 micrograms/liter average for natural lakes in Wisconsin. However, phosphorus levels have increased since 1997, so this needs to be monitored and addressed in a lake management plan.



The third measure used in trophic state classification is the amount of chlorophyll-a contained in the lake. The amount of chlorophyll-a found in a lake is an indication about the amount of algae in the lake. The 2004-2006 summer average chlorophyll-a concentration in Wolf Lake was 2.8 micrograms/liter. This level of chlorophyll-a gives Wolf Lake a “very good” ranking for chlorophyll-a (i.e., it’s very low). Since 1990, Wolf Lake’s chlorophyll-a levels have remained very low.

In-Lake Habitat

Aquatic Plants

A diverse aquatic plant community plays a vital role in improving water quality, providing valuable habitat resources for fish and wildlife, resisting invasions of non-native species and checking excessive growth of the most tolerant species.

An updated aquatic plant survey was performed in 2005. The 0-1.5ft depth zone supported the most abundant aquatic plant growth. The Wolf Lake aquatic plant community is characterized by high quality and excellent species diversity. *Chara* spp (muskgrass), *Elodea canadensis* (waterweed), and *Najas guadalupensis* (Southern naiad)) were the most common aquatic species.

Important to maintaining a high quality, diverse aquatic plant community is an integrated aquatic plant management plan. This plan should also address management of invasive plants in the lake. The most prevalent invasive plant in Wolf Lake is currently *Myriophyllum spicatum* (Eurasian watermilfoil). It occurs at below average densities, but was abundant only at depths greater than 10 feet. Other invasive plants found were *Potamogeton crispus* (Curly-Leaf Pondweed) and *Lythrum salicaria* (Purple Loosestrife). The latter two are less common at Wolf Lake.

More detailed information can be found in the aquatic plant report of the 2005 survey, available on request from the WDNR or Adams County Land & Water Conservation Department.



Curly-Leaf Pondweed



Purple Loosestrife



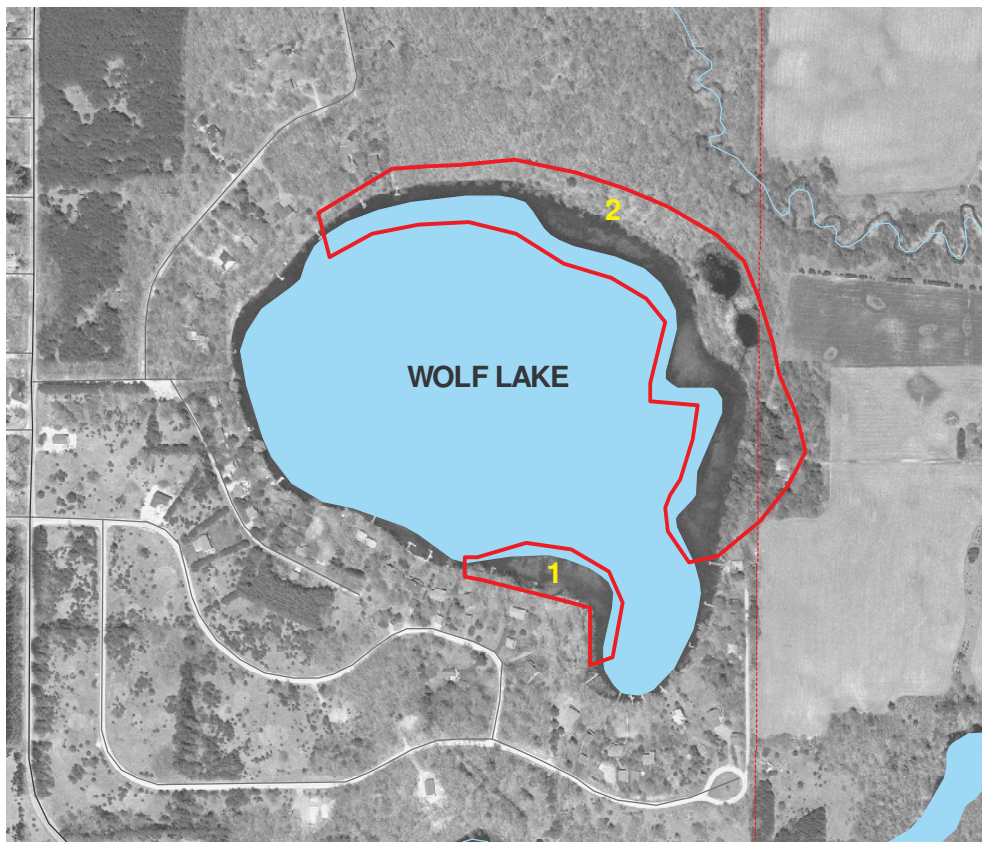
Eurasian Watermilfoil

Critical Habitat

Wisconsin Rule 107.05(3)(i)(I) defines a “critical habitat areas” as: “areas of aquatic vegetation identified by the department as offering critical or unique fish & wildlife habitat or offering water quality or erosion control benefits to the body of water. Thus, these sites are essential to support the wildlife and fish communities. They also provide mechanisms for protecting water quality within the lake, often containing high-quality plant beds. Finally, critical habitat areas often can provide the peace, serenity and beauty that draw many people to lakes in the first place.

Two areas on Wolf Lake were determined to be appropriate for critical habitat designation. WL1 extends along approximately 425 feet of the southeastern shoreline of Wolf Lake, up to the ordinary high water mark. WL2 extends along approximately 1900 feet of the northern shoreline. This area extends landward from the shore to cover the deep marsh and wetlands located near the shore.

Critical Habitat Areas—Wolf Lake



RE:6/06



Photo of part of Area WL1



Photo of Part of WL2

The Critical Habitat Report for Wolf Lake has more specific information on these sites. Copies are available from the Adams County Land & Water Conservation Department.

Fishery/Wildlife/Endangered Resources

A 1948 fishery inventory of Wolf Lake described it as “a small bass lake, fertile, hard water, moderate plankton, with heavy fishing pressure.” Bluegills were the most abundant fish found then. At that time, it was also recommended trout no longer be stocked in Wolf Lake. A 1997 fish inventory found largemouth bass and bluegill were present in great numbers, but bullheads, perch, rock bass and pumpkinseeds were still scarce.

Muskrat and mink are also known to use Wolf Lake shores for cover, reproduction and feeding. Seen during the field survey were various types of waterfowl, songbirds, and turkey. Frogs and salamanders are known, using the lake shores for shelter/cover, nesting and feeding. Turtles and snakes also use this area for cover or shelter in this area, as well as nested and fed in this area. A pair of eagles has nested here for the past several years. Sandhill cranes have also nested on Wolf Lake. Upland wildlife feed and nest here as well. An endangered species, Banded Killifish, was found in the lake in 1996.



Sandhill Crane Nest at Wolf Lake in 2006



Eagle's Nest at Wolf Lake 2006

Recommendations

Lake Management Plan

- By the end of 2008, if not sooner, Wolf Lake Association should develop a lake management plan. The Adams County Land & Water Conservation Department is available for assistance, if requested.
- The lake plan needs to include at least the following aspects concerning the management of the lake: aquatic species management; control/management of invasive species; wildlife and fishery management; nutrient budgeting; shoreland protection; critical habitat protection; water quality protection.

Watershed Recommendations

- Since computer modeling results suggest that input of nutrients, especially phosphorus, are a factor that needs to be explored for Wolf Lake, it is recommended both the surface and ground watersheds be inventoried, documenting any of the following: runoff from any livestock operations that may be entering the surface water; soil erosion sites; agricultural producers not complying with nutrient management plans and/or irrigation water management plans.
- If such sites are documented, steps for dealing with these issues can be incorporated into the lake management plan.

Water Quality Recommendations

- All lake residents should practice best management on their lake properties, including keeping septic systems maintained in proper condition and pumped every three years, eliminating the use of lawn fertilizers, cleaning up pet wastes and not composting near the water.
- Reducing the amount of impervious surface around the lake and management of stormwater runoff will also help maintain water quality.
- Residents should continue involvement in the Citizen Lake Water Monitoring Program.
- Lake residents should protect and restore natural shoreline around Wolf Lake. The lower frequency and density of the most sensitive plant species in the disturbed shoreline areas is evidence that shore disturbance is impacting the aquatic plant community of the lake.

Aquatic Plant Recommendations

- All lake users should protect the aquatic plant community in Wolf Lake by assisting in developing and implementing an integrated aquatic plant management plan that uses multiple methods of control.
- The Wolf Lake Association should maintain exotic species signs at the boat landings and contact DNR if the signs are missing or damaged.
- The Wolf Lake Association should continue monitoring and control of Eurasian Watermilfoil maintain the most effective methods and modify if necessary. The Lake Association should investigate ways to increase treatment effectiveness in the deeper water. Residents may need to hand-pull scattered plants.
- A milfoil weevil survey should be conducted on Wolf Lake in order to evaluate milfoil weevil availability for assistance in controlling the Eurasian Watermilfoil.
- Shores with inadequate buffers need to restore the buffers to an adequate condition to provide winter habitat for the native weevils, as well to assist in maintaining water quality.
- Lake residents should get involved in the county-supported Citizen Aquatic Invasive Species Monitoring Program. This will allow not only noting changes in the Eurasian Watermilfoil pattern, but also those for Curly-Leaf Pondweed and Purple Loosestrife. Noting the presence and density of these plants early is the best way to take preventive action to keep them from becoming a bigger problem.

Critical Habitat Recommendations

- Maintain current habitat for fish and wildlife.
- Leave fallen trees along shoreline & in water.
- Seasonal protection of spawning habitat.
- Maintain the wildlife corridor.
- Maintain sedge meadow/deep marshes areas.
- Protection emergent vegetation.
- Seasonal control of exotics.
- No bank grading or grading of adjacent land.
- Maintain aquatic vegetation in undisturbed condition for wildlife habitat, fish use and water quality protection.
- Maintain lake no-motor designation.